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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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WELLS ST. JOHN ROBERTS GREGORY & MATKIN P.S.
601 W. FIRST AVENUE
SUITE 1300
SPOKANE, WA 99201-3828

EXAMINER

ZARNEKE, DAVID A

ART UNIT PAPER NUMBER

2827

DATE MAILED: 03/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/756,971

Applicant(s)

AKRAM, SALMAN

Examiner

David A. Zarneke

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 7-30-02.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 42-79 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 75-79 is/are allowed.
- 6) ☒ Claim(s) 42-57 and 63-74 is/are rejected.
- 7) ☒ Claim(s) 58-62 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10, 12
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 42-74 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 42 and 43 are rejected under 35 U.S.C. 102(e) as being unpatentable over Chan et al., US Patent 5,998,860.

Chan teaches a memory module comprising:

providing an insulative substrate (70) with circuitry thereon and an opening there through;

adhering a die (50) to the substrate with an electrically conductive adhesive (60) having circuitry supported thereby; and

electrically connecting the circuitry on the die to the circuitry on the substrate with wire bonds (80) extending through the opening (Figure 1).

Regarding claim 43, Chan teaches the adhesive as being a silver-filled epoxy (3, 61-4, 35).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al., US Patent 5,998,860, as applied to claim 42 above, and further in view of Chen et al., US Patent 6,215,180.

Chan, relied upon as taught above, fails to teach the placing of a metal foil in physical contact with at least a portion of the die.

Chen teaches a heat dissipating structure comprising a heat dissipating member (59) in physical contact with at least a portion of the die (figure 5).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the heat dissipating member of Chen in the invention of Chan because Chen teaches that heat generated by the chip is dissipated by the member (abstract).

Claims 45, 49-51, 53, 55 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al., US Patent 5,998,860, in view of Chen et al., US Patent 6,215,180.

Chan teaches a memory module comprising:

providing an insulative substrate (70) with circuitry thereon and an opening there through;

adhering a die (50) to the substrate with an electrically conductive adhesive (60) having circuitry supported thereby; and

electrically connecting the circuitry on the die to the circuitry on the substrate with wire bonds (80) extending through the opening (Figure 1).

Chan fails to teach the placing of a metal foil in physical contact with at least a portion of the die.

Chen teaches a heat dissipating structure comprising a heat dissipating member (59) in physical contact with at least a portion of the die (figure 5).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the heat dissipating member of Chen in the invention of Chan because Chen teaches that heat generated by the chip is dissipated by the member (abstract) thereby improving performance.

With respect to claim 49, Chen also teaches the heat dissipating member as touching only a portion of the die (Figure 4).

As to claim 50, Chen teaches the heat dissipating member as contacting the entire surface of the die (Figures).

Regarding claims 51 and 53, Chen teaches the die as having a 1st surface facing the substrate and a 2nd surface opposite the 1st with sidewalls therebetween, wherein the foil is proximate the sidewalls and extends across the sidewall to physically contact the 2nd surface (claim 51) leaving a gap between the foil and the sidewall (claim 53).

With respect to claim 55, Chen teaches the heat dissipating member as being made of Al or Cu (4, 39+).

As to claims 56, Chan teaches the die to be attached to the substrate using an adhesive layer comprising an Ag filled thermosetting resin such as epoxy (3, 61 - 4, 36).

Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al., US Patent 5,998,860, in view of Chen et al., US Patent 6,215,180, as applied to claim 45 above, and further in view of Tummala et al., Microelectronics Packaging Handbook, Semiconductor Packaging – Part II, 2nd Edition, pages 898-901.

Both Chen and Chan fail to teach the use of welding, specifically laser welding, to attach the metal foil to the substrate.

Tummala teaches the use of laser welding to attached metal lids to packages (900, last paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the laser welding of Tummala in the inventions of Akram because Tummala teaches that laser welding is attractive "because of its high speed, very limited heat input to sensitive areas, ability to handle unconventional seal geometries, and noncontact nature" (900, last paragraph).

Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al., US Patent 5,998,860, in view of Chen et al., US Patent 6,215,180, as applied to claim 45 above, and further in view of Tummala et al., Microelectronics Packaging Handbook, Subsystem Packaging – Part III, 2nd Edition, pages 223-234.

Both Chen and Chan fail to teach the use of an electrically conductive adhesive to adhere the metal foil to the substrate or the die to the substrate.

Tummala teaches using Ag-filled epoxies as electrically conductive adhesives (p. 227-228).

As evinced by Tummala above, electrically conductive adhesives are conventionally known to be used to connect chips to insulative substrates. The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Claims 52 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al., US Patent 5,998,860, in view of Chen et al., US Patent 6,215,180, as applied to claim 45 above, and further in view of Wang et al., US Patent 6,225,140.

Both Chen and Chan fail to teach the heat dissipating member as physically contacting the sidewall and also a gap between the sidewall and the heat dissipating member which is filled with an electrically conductive epoxy.

Regarding claim 52, Wang teaches a flip chip scale package comprising attaching a reverse U-shaped heat slug (312) to the die that contacting the sidewalls of the die (3, 24+). Wang's teaching that a space "may exist" means that the space also does not have to exist.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the heat slug of Wang in the invention of both Akram because the increased contact surface area of the slug improves heat dissipation.

With respect to claim 54, Wang teaches that the heat slug is attached to the die using a conductive epoxy (3, 26+).

Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakashima et al., US Patent 5,661,086, in view of Chen et al., US Patent 6,215,180.

Nakashima teaches a process of making a plurality of strip lead frames comprising:

- forming a connected circuit substrate frame made of glass fabric reinforced epoxy resin (an insulative substrate) having a lead pattern on one face and an opening there through (6, 43+);

- forming a connected metals frame and adhering it to a second face of the connected circuits frame;

- mounting a die onto the connected metals frame within the opening; and

- electrically connecting, using bond wires that extend through the opening, the die to the lead pattern (figure 1).

Nakashima fails to teach the die adhering to both the metals frame and the circuits frame.

Chen teaches a heat dissipating structure wherein a structure similar to Nakashima is disclosed (Figure 1) and a structure wherein the die (21) is adhered to

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both a metal heat dissipating member (26) and an insulative substrate (22) having circuits thereon (Figures 2+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Nakashima to form the structure of Chen because Chen teaches that the structure of Figure 2 is an alternative to the structure of Figure 1. Therefore, one of ordinary skill in the art would apply the process of Nakashima to the alternative invention of Chen.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution. *Ex parte Novak* 16 USPQ 2d 2041 (BPAI 1989); *In re Mostovych* 144 USPQ 38 (CCPA 1964); *In re Leshin* 125 USPQ 416 (CCPA 1960); *Graver Tank & Manufacturing Co. V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 42-44 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram, in view of Tummala, Microelectronics Packaging Handbook, Subsystem Packaging – Part III, 2Nd Edition, pages 223-234.

Both patents teach providing an insulative substrate (12) with circuitry thereon (46) and an opening (20) there through; adhering a die (32) to the substrate with an adhesive (34) having circuitry (44) supported thereby; and electrically connecting the circuitry on the die to the circuitry on the substrate with wire bonds (42) extending through the opening (Figure 2).

Both Akram patents fail to specifically name the adhesive (34) as being an electrically conductive adhesive.

Tummala teaches the use of an electrically conductive adhesive to bond a chip to a insulative substrate.

As evinced by Tummala above, electrically conductive adhesives are conventionally known to be used to connect chips to insulative substrates. The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Regarding claim 43, Tummala teaches using Ag-filled epoxies as electrically conductive adhesives (p. 227-228).

With respect to claim 44, both Akram patents teach that a heat conductive lid (72) may be attached to the bottom of the die and the insulative substrate ('641: 7, 7+ &

'535: 6, 62+). While not specifically stating that a metal is used as the lid, metal is inherently a heat conductive material.

Claims 45 and 50 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram.

Both Akram patents teach providing an insulative substrate (12) with circuitry thereon (46) and an opening (20) there through; adhering a die (32) to the substrate having circuitry (44) supported thereby; electrically connecting the circuitry on the die to the circuitry on the substrate with wire bonds (42) extending through the opening (Figure 2); and joining a heat conductive lid (72) to the bottom of the die and the insulative substrate ('641: 7, 7+ & '535: 6, 62+).

While Akram does not specifically teach that metal is used to form the heat conductive lid, metal is a conventionally known heat conductive material. The use of conventional materials to perform their known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Regarding claim 50, both Akram patents teach the foil being in contact with the entire 2nd surface of the die (Figure 2).

Claims 46 and 47 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram, as applied to claim 45 above, and further in view of Tummala et al., Microelectronics Packaging Handbook, Semiconductor Packaging – Part II, 2nd Edition, pages 898-901.

Both Akram patents fail to teach the use of welding, specifically laser welding, to attach the metal foil to the substrate.

Tummala teaches the use of laser welding to attached metal lids to packages (900, last paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the laser welding of Tummala in the inventions of Akram because Tummala teaches that laser welding is attractive "because of its high speed, very limited heat input to sensitive areas, ability to handle unconventional seal geometries, and noncontact nature" (900, last paragraph).

Claims 48 and 56 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram, as applied to claim 45 above, and further in view of Tummala et al., Microelectronics Packaging Handbook, Subsystem Packaging – Part III, 2nd Edition, pages 223-234.

Both Akram patents fail to teach the use of an electrically conductive adhesive to adhere the metal foil to the substrate or the die to the substrate.

Tummala teaches using Ag-filled epoxies as electrically conductive adhesives (p. 227-228).

As evinced by Tummala above, electrically conductive adhesives are conventionally known to be used to connect chips to insulative substrates. The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Claims 49 and 55 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram, as applied to claim 45 above, and further in view of Chen et al., US Patent 6,215,180.

Both Akram patents fail to teach the metal foil contacting only a portion of the die and the metal foil being made of Cu or Al.

Chen teaches a heat dissipating structure that contacts only a portion of the die (Figure 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the heat dissipating structure of Chen in the inventions of Akram because Chen teaches that IC performance and reliability is improved (1, 13+).

Regarding claim 55, Chen teaches the heat dissipater being made of Al or Cu (4, 39+).

Claims 51-54 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram, as applied to claim 45 above, and further in view of Wang et al., US Patent 6,225,140.

Both Akram patents fail to teach the metal foil as overhanging the sidewalls of the die.

Wang teaches a flip chip scale package comprising attaching a reverse U-shaped heat slug (312) to the die that also overhangs the sidewalls (Figure 3A & 3,1+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the heat slug of Wang in the invention of both Akram because the increased contact surface area of the slug improves heat dissipation.

Regarding claims 52 and 53, Wang teaches the heat slug as contacting the sidewalls of the die (3, 24+). Wang's teaching that a space "may exist" means that the space also does not have to exist.

With respect to claim 54, Wang teaches that the heat slug is attached to the die using a conductive epoxy (3, 26+).

Claims 63-67 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535. Although the conflicting claims are not identical, they are not patentably distinct from each other because both claim an insulative substrate having cavities on one side wherein a die is placed, electrically connecting the die to the substrate by extending electrical interconnects through the opening to the top surface of the substrate, and placing a metal sheet in physical contact with at least a portion of the die.

Claim 68, 69, 71 and 74 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram.

Both patents teach providing an insulative substrate (12) with a repeating circuitry pattern thereon (46) and openings (20) there through; adhering a plurality of dice (32) to the substrate with an adhesive (34) having circuitry (44) supported thereby;

electrically connecting the circuitry on the dice to the circuitry on the substrate with wire bonds (42) extending through the openings (Figure 2); and joining a metal foil to the substrate and extending the foil over the plurality of dice.

Both Akrams fail to teach singulating the substrate.

The singulating of the substrate is an obvious matter of design choice. Design choices and changes of size are generally recognized as being within the level of ordinary skill in the art (MPEP 2144.04(d)). The singulating of a string of packages into individual packages is an obvious next step in the processing of a package.

In order to make as many packages as possible as easily as possible long strings of packaging substrates are formed having sections to be singulated, dice are placed on each section, packaged and then singulated into individual die packages.

This process is more than well-known in the prior art.

Regarding claims 69 and 74, it would have been obvious to one ordinary skill in the art at the time of the invention to optimize the point at which the metal foil is attached to the substrate (MPEP 2144.05(b)).

Claim 70 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram, as applied to claims 68 and 69, and further in view of Tummala et al., *Microelectronics Packaging Handbook, Semiconductor Packaging – Part II*, 2nd Edition, pages 898-901.

Both Akram patents fail to teach the use of welding, specifically laser welding, to attach the metal foil to the substrate.

Tummala teaches the use of laser welding to attached metal lids to packages (900, last paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the laser welding of Tummala in the inventions of Akram because Tummala teaches that laser welding is attractive "because of its high speed, very limited heat input to sensitive areas, ability to handle unconventional seal geometries, and noncontact nature" (900, last paragraph).

Claims 72 and 73 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent Nos. 6,214,641 and 5,817,535, both to Akram, as applied to claims 68 and 69, and further in view of Tummala, Microelectronics Packaging Handbook, Subsystem Packaging – Part III, 2Nd Edition, pages 223-234

Tummala teaches the use of an electrically conductive adhesive to bond a chip to a insulative substrate.

As evinced by Tummala above, electrically conductive adhesives are conventionally known to be used to connect chips to insulative substrates. The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Regarding claim 73, Tummala teaches using Ag-filled epoxies as electrically conductive adhesives (p. 227-228).

Allowable Subject Matter

Claims 58-62 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 75-79 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: these claims incorporate the limitations of objected claims 58-62 into and independent claim.

Conclusion

Any inquiry concerning this communication from the examiner should be directed to David A. Zarneke at (703)-305-3926. The examiner can normally be reached on M-F 10AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott can be reached on (703)-305-9883. The fax phone number where this application is assigned is (703)-308-7722 for regular communications.

Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is (703)-308-0956.

David A. Zarneke
February 14, 2003

David A. Zarneke
AV2827